MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for June, 1902, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: Regular stations of the Weather Bureau, 162; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Government Survey, 200; Canadian Meteorological Service, 33; Jamaica Weather Office, 160; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Capt. François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores; W. M. Shaw, Esq. Secretary, Meteorological Office, London; and Rev. Josef Algué, S. J., Director, Philippine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San Jose, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Over the greater part of the United States the spring and early summer of 1902 has been unseasonable.

From the Rocky Mountain districts to the Atlantic coast the advent of spring weather was delayed until the first decade of April by a remarkable succession of general storms that appeared in the West and Northwest, swung south of east over the central valleys, and moved thence north of east to the Atlantic coast. May was notable chiefly for the unusual frequency of frost in the northern tier of States.

In June the temperature was low, with excessive rainfall in the North, while in the South high temperature and semi-drought conditions prevailed. In the middle latitudes of the country, where the monthly temperature and rainfall corresponded closely with the June average, the means were a product of extremes that obtained during periods of excess and deficiency in temperature and rainfall. The general atmospheric conditions over the United States, that were associated with the unseasonable weather of June, appear on the weather maps as a succession of general storms that crossed the northern part of the country and a prevalence of relatively high barometric pressure over the Southern States.

Five storms of moderate intensity advanced from the coast of the United States over or near Newfoundland in June. One of these storms first appeared over the Gulf of Mexico, passed northeastward along the Atlantic coast of the United States during the 15th and 16th, was central over the Canadian Maritime Provinces on the 17th, and passed northeast of Newfoundland during the 18th. This disturbance was located over mid ocean on the 19th, and on the 20th its approach was indicated by reports from stations on the west coast of Ireland, where a barometric pressure of 29.24 inches was reported at Valentia. During the 21st and 22d this storm moved northward off the west coasts of Ireland and Scotland. From the 11th to the 13th a disturbance moved southeastward over the British Isles, with barometric pressure of 29.40 inches at London on the 13th; during the 14th and 15th this storm area passed northeastward over the North Sea. From the 23d to the 29th a well-marked disturbance moved slowly from New England over the Canadian Maritime Provinces and Newfoundland, with lowest reported barometric pressure, 29.20 inches, at Montreal on the 26th.

In the Lake region notable storms occurred on the 25th, and from the 28th to the 30th. The storm of the last three days of the month on the lakes first appeared near the mouth of the Rio Grande River on the morning of the 26th, moved northeastward inside the coast line of Texas during the 27th,

and the center reached the Mississippi River, between Cairo and St. Louis, by the evening of the 28th. On the morning of the 29th the center was over Ohio, where it remained nearly stationary, with diminishing strength, until the close of the month. No general storms of marked intensity occurred on the Pacific coast.

During the third decade of the month severe local storms, heavy rain, and high winds occurred in parts of the Lake region and the Ohio and middle and upper Mississippi valleys. In Missouri and Illinois crops were damaged by heavy rains.

The noteworthy frosts of the month occurred in the North Atlantic States on the 10th and in the Northwestern States on the 20th.

Ample warning was given of the general storms that visited the coasts and Great Lakes.

BOSTON FORECAST DISTRICT.

The only conspicuous features of the month were the moderate gales of the 7th, 9th, and 10th, for which warnings were displayed, and the general and severe frost of the 10th, which was announced in the morning forecast of the 9th.—*J. W. Smith, Forecast Official.*

NEW ORLEANS FORECAST DISTRICT.

The third decade of the month was stormy, and the severest weather resulted from the Gulf storm of the 26–27th, in connection with which ample and timely warnings were issued.—*I. M. Cline, Forecast Official.*

CHICAGO FORECAST DISTRICT.

Storm warnings were ordered on the three upper lakes on the morning of the 25th, and on Lakes Michigan and Huron during the afternoon of the 28th. The storm of the 25th was not severe. The second storm, that had moved from the western Gulf of Mexico, was very severe over the southern part of the Lake region. An extensive frost, for which warnings were issued, occurred in the Northwestern States on the morning of the 20th. The month was marked by an unusual amount of rainfall over almost the entire district, and abnormally cool weather during the last half of the month, and these conditions were generally forecast.—*H. J. Cox, Professor.*

DENVER FORECAST DISTRICT.

No special warnings were issued during the month.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The weather of the month was not marked by notable abnormal features and no special warnings were issued.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The rainfall was deficient, and light frost, for which warnings were issued, occurred on several mornings.—*E. A. Beals, Forecast Official.*

RIVERS AND FLOODS.

Fairly good navigable stages of water prevailed in the principal rivers of the United States during the month of June, especially in the Mississippi and its western tributaries. Except from St. Paul, Minn., to Dubuque, Iowa, where there was very little change, the mean stages of the Mississippi were considerably higher than those of the preceding month, the excess being most notable from Galland, Iowa, to Vicksburg, Miss. In the Missouri River the mean stages, at all points from which reports were received, averaged about four feet higher than during May, and on the 11th of the month the danger lines were nearly reached at St. Joseph and Kansas City, Mo. The eastern tributaries of the Mississippi were generally lower than at the close of May, the changes being slight in the Ohio and Tennessee rivers, but more pronounced in the Cumberland. Slight floods occurred in the upper portion of the Red River from the 1st to the 7th, and the danger lines were reached or exceeded during the month in the Pedee, Wateree, and Willamette rivers, but little if any damage resulted to growing crops or other property.

The highest and lowest water, mean stage, and monthly range at 138 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*George E. Hunt, Chief Clerk Forecast Division.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, a.m..	53	114	7, a.m..	32	65	3,125	4.0	781	32.5
II	5, p.m..	48	125	9, p.m..	39	75	2,900	4.0	725	30.2
III	14, p.m..	50	111	18, p.m..	32	65	2,800	4.0	700	29.2
IV	19, a.m..	52	122	24, a.m..	37	76	3,325	5.0	665	57.7
Sums							12,150	17.0	2,871	119.6
Mean of 4 paths							3,038		718	29.9
Mean of 17 days									715	29.8
Low areas.										
I	*31, a.m..	39	120	5, a.m..	47	54	4,000	5.0	800	33.3
II	4, p.m..	47	112	9, a.m..	46	60	3,025	4.5	672	28.0
III	13, a.m..	23	82	18, a.m..	47	54	2,675	5.0	535	22.3
	13, p.m..	44	104				2,575	4.5	572	23.8
IV	16, a.m..	48	115	20, a.m..	47	65	2,550	4.0	638	26.6
V	20, a.m..	35	90	21, p.m..	46	78	1,075	1.5	717	29.9
VI	23, p.m..	44	116	27, a.m..	48	68	2,825	3.5	807	33.6
VII	24, a.m..	33	115	29, p.m..	39	75	3,200	5.5	582	24.3
	26, p.m..	28	97				1,875	3.0	625	26.0
VIII	27, p.m..	32	106	† 1, a.m..	42	71	2,425	3.5	* 693	28.9
Sums							26,225	40.0	6,641	276.7
Mean of 10 paths							2,622		664	27.7
Mean of 40 days									656	27.3

*May. †July.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk Forecast Division.*